APPENDIX G

Data Validation Reports

WATER QUALITY MONITORING SAMPLE DATA VALIDATION REPORTS

PCBs and Mercury
Part 1

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Sayler Data Solutions, Inc.

DATA VALIDATION REPORT

Boeing Plant 2 Water Quality Samples –January 2014

Prepared for:
AMEC Environment & Infrastructure, Inc.
3500 188th Street SW, Ste 601
Lynnwood, WA 98037-4763

April 04, 2014

1.0 Introduction

Data validation was performed on the following Analytical Resources, Inc (ARI) samples:

		Laboratory Sample IDs		
Sample ID	Sample Date	PCBs	Total Mercury	Dissolved Mercury
BP2WQ-0270	1/3/14 12:34	XT17A	XT17A	XT17F
BP2WQ-0271	1/3/14 12:49	XT17B		
BP2WQ-0273	1/3/14 13:44	XT17D		
BP2WQ-0285	1/6/14 15:48	XT35E	XT35E	XT35F
BP2WQ-0293	1/7/14 14:40			XT55H
BP2WQ-0294	1/7/14 14:42	XT55I	XT55I	
BP2WQ-0250	1/7/14 20:40	XT60A	XT60A	XT60B
BP2WQ-0301	1/8/14 15:17	XT81E	XT81E	XT81G
BP2WQ-0302	1/8/14 15:17	XT81F	XT81F	XT81H
BP2WQ-0252	1/10/14 5:35	XU44A XU96A	XU44A	XU44B
BP2WQ-0319	1/14/14 11:43	XU74A	XU74A	XU74I
BP2WQ-0320	1/14/14 12:26	XV31A		
BP2WQ-0327	1/15/14 10:57	XU90B	XU90B	XU90F
BP2WQ-0329	1/15/14 12:12	XV30A		
BP2WQ-0336	1/17/14 11:42	XV24B	XV24B	XV24J

Validation: A summary validation was performed for these analyses. Validation was performed by Cari Sayler. Data qualifiers are summarized in section 4.0 of this report.

Analytical methods: Table 6 of the QAPP specifies the following analytical methods:

Analysis	Method
Polychorinated Biphenyls	EPA 8082
Mercury	EPA 7471A

These methods were used with the following exceptions: The most recent version of the method for PCB (8082A) was used. The water version of the mercury method (7470A) was used. Method substitutions were considered acceptable.

Requested analyses: Sample chain-of-custodies were reviewed. All requested analyses were performed.

Sample number transcription: Sample IDs in the electronic data deliverable (EDD) were compared to the chain-of-custody for each sample. Except for an extra W in the dissolved mercury analysis of BP2WQ-0252, all ARI sample IDs matched the chain of custody.

2.0 PCB Analyses

Quality control analysis frequencies: The QAPP specifies that the following quality control samples be analyzed one per analytical batch or one per twenty samples, whichever is more frequent: method blank, and laboratory control sample (LCS). A matrix spike (MS) and MS duplicate (MSD) must be analyzed one per twenty samples and a regional reference material (RRM) must be analyzed one per fifty samples. In addition, surrogate compounds must be measured in each field and quality control sample. Field quality control sample requirements include field duplicates and rinse blanks once per sampling round.

Each batch included a method blank, LCS, LCS duplicate and appropriate surrogates. One field duplicate (BP2WQ-0302) and one rinse blank (BP2WQ-0294) were also analyzed. No qualifiers are added based on the lack of MS/MSD and RRM samples.

Holding times: Water samples must be extracted within 7 days of collection. Extracts must be analyzed within 40 days of extraction. These holding times were met.

Instrument calibration: Data usability criteria for calibrations include minimum correlation coefficients (R^2) of 0.990 or maximum RSDs of $\pm$20% for each initial calibration, and maximum % differences of $\pm$25% for each continuing calibration. All initial calibration compound RSDs were within 20%. Continuing calibration % differences were within $\pm$25%.

Laboratory and field blank results: Criteria for blanks are that analyte concentrations must be below the RL, or below 10% of the lowest associated sample concentration. These criteria were met.

Surrogate recoveries: QAPP control limits were 34-141%. Surrogate recoveries were within QAPP and laboratory control limits.

LCS recoveries: QAPP control limits were 37-116%. LCS recoveries were within QAPP and laboratory control limits.

LCS/LCSD RPDs: QAPP control limits were 50%. RPDs were within QAPP and laboratory control limits.

Field duplicate RPDs: No PCBs were detected in either the sample or field duplicate, and RPDs could not be evaluated.

Reporting limits: RLs for various aroclors were elevated above 0.01 ug/L due to chromatographic overlap with other aroclors. With the exception of sample BP2WQ-0273, these samples also contained detected aroclors and the impact on the total PCB value was minimal. No qualifiers are assigned on the basis of elevated reporting limits.

Multiple reported results: Unless quality control results warrant the rejection of one result, multiple reported results are evaluated according to the following guidelines

(1) If both results are non-detects, the lower reporting limit was selected.
(2) If one result was not detected and the other detected, the detection was selected.
(3) If both results were detections, the following additional criteria were applied:
(a) If one result was off-scale and one was on-scale, the on-scale result was selected.
(b) If associated QC results indicated high bias, the lower concentration result was selected.
(c) If associated QC results indicated no, low, or mixed biases, the higher concentration result was selected.

This approach is conservative, and is considered most protective of the environment. The results not selected as the best result to report are qualified R1, rejected due to the availability of better results.

Laboratory narrative and qualifiers: Various results are flagged Y to indicate elevated reporting limits. These results are qualified "UY" to clarify that the aroclor was not detected. No additional qualifiers are assigned based on a review of the laboratory narrative.

Overall assessment: Documentation was found to be clear and complete. Calibration data demonstrate acceptable instrument performance. Laboratory control sample results demonstrate acceptable accuracy and precision. Multiple analysis results were reduced to the most appropriate to use.

Except for data replaced by another result, PCB data are acceptable for use as reported.

3.0 Total and Dissolved Mercury Analyses

Quality control analysis frequencies: The QAPP specifies that the following quality control samples be analyzed one per analytical batch or one per twenty samples, whichever is more frequent: method blank, and laboratory control sample (LCS). A matrix spike (MS) and MS duplicate (MSD) or laboratory duplicate must be analyzed one per twenty samples. Field quality control sample requirements include field duplicates, filter blanks and rinse blanks once per sampling round.

Each batch included a method blank, LCS, MS and laboratory duplicate. One field duplicate (BP2WQ-0302), one filter blank (BP2WQ-0293), and one rinse blank (BP2WQ-0294) were also analyzed, meeting project requirements.

Holding times: Total or dissolved mercury samples must be analyzed within 28 days of collection. Samples were analyzed within the holding time.

Instrument calibration: Functional guidelines criterion for calibration verifications is a maximum % difference of ±15%. QAPP criterion for calibration verifications is ±20%. These criteria were met.

Laboratory and field blank results: Criteria for calibration and method blanks are that analyte concentrations must be below the RL, or below 10% of the lowest associated sample concentration. No contamination was detected in the method or calibration blanks.

LCS recoveries: QAPP control limits were 80-120%. LCS recoveries were within QAPP and laboratory control limits.

MS recoveries: QAPP control limits were 80-120%. MS recoveries were within QAPP and laboratory control limits with the following exception:

QC ID	Analyte	% Recovery	Lab Control Limit
BP2WQ-0319MS	Mercury	375	75 - 125

According to the laboratory narrative, the high mercury percent recovery was likely due to a spiking error, and no qualifiers are assigned.

Laboratory duplicate RPDs: QAPP control limits were <20%. For duplicates with concentrations above five times the reporting limit, RPDs were within QAPP and laboratory control limits. For duplicates with concentrations below five times the reporting limit, absolute differences were within the reporting limit.

Field duplicate RPDs: Total and dissolved mercury were not detected in the field duplicate or parent sample, and RPDs could not be evaluated.

Reporting limits: The QAPP specifies target reporting limits of 0.020 ug/L. This limit was met.

Laboratory narrative and qualifiers: No additional qualifiers are assigned based on a review of the laboratory narrative.

Overall assessment: Documentation was found to be clear and complete. Calibration data demonstrate acceptable instrument performance. Quality control sample results demonstrate acceptable accuracy and precision.

Total and dissolved mercury data are acceptable for use as reported.

4.0 Qualifier Summary Table

Client ID	Analyte(s)	Qualifier	Reason
Polychorinated Biphenyl Analyses			
BP2WQ-0252	Aroclor 1260	R1	Another result available
BP2WQ-0252 RE	All except Aroclor 1260	R1	Another result available
BP2WQ-0270	Aroclor 1232	UY	Clarification of Y flag
BP2WQ-0271	Aroclor 1232	UY	Clarification of Y flag
BP2WQ-0273	Aroclor 1232	UY	Clarification of Y flag
BP2WQ-0319	Aroclor 1232, Aroclor 1254	UY	Clarification of Y flag
BP2WQ-0320	Aroclor 1254	UY	Clarification of Y flag
BP2WQ-0327	Aroclor 1232, Aroclor 1254	UY	Clarification of Y flag
BP2WQ-0336	Aroclor 1248	UY	Clarification of Y flag
BP2WQ-0336	Aroclor 1254, Aroclor 1260	R1	Another result available
BP2WQ-0336 RE	Aroclor 1254	UY	Clarification of Y flag
BP2WQ-0336 RE	All except Aroclor 1254, Aroclor 1260	R1	Another result available

5.0 Abbreviations and Definitions

DV Qualifier	Definition
U	The material was analyzed for, but was not detected above the level of the associated value.
UY	The reporting limit was elevated due to chromatographic overlap with related compounds. The material was analyzed for, but was not detected above the level of the associated value.
J	The analyte was positively identified. The associated numerical value is the approximate concentration of the analyte in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
UJ	The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	The sample result is rejected. The presence or absence of the analyte cannot be verified and data are not usable.
R1	This sample result has been rejected in favor of a more accurate and/or precise result. The other result should be used.

Abbreviation	Definition
DV	Data validation
LCS	Laboratory control sample
MS	Matrix spike
MSD	Matrix spike duplicate
NA	Not Applicable
RPD	Relative percent difference
RRM	Regional reference material
RSD	Relative standard deviations
SRM	Standard reference material
Surr	Surrogate

6.0 References

USEPA Contract Laboratory Program National Functional Guidelines For Superfund Organic Methods Data Review, Office of Superfund Remediation and Technology Innovation, U.S. Environmental Protection Agency, June 2008, USEPA-540-R-008-01.

USEPA Contract Laboratory Program National Functional Guidelines For Inorganic Superfund Data Review, Office of Superfund Remediation and Technology Innovation, U.S. Environmental Protection Agency, January 2010, USEPA-540-R-10-011.

Water Quality Monitoring, Quality Assurance Project Plan, Duwamish Sediment Other Area and Southwest Bank Corrective Measure and Habitat Project, Boeing Plant 2. Prepared by AMEC Environment & Infrastructure Inc., et al. Prepared for: The Boeing Company, December 2012.

PCBs and Mercury
Part 2

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Sayler Data Solutions, Inc.

DATA VALIDATION REPORT

Boeing Plant 2 Water Quality Samples –January 2014

Prepared for:
AMEC Environment & Infrastructure, Inc.
3500 188th Street SW, Ste 601
Lynnwood, WA 98037-4763

March 13, 2014

1.0 Introduction

Data validation was performed on the following Analytical Resources, Inc (ARI) samples:

Sample ID	Sample Date	Laboratory Sample IDs	Analyses
BP2WQ-0337	01/17/14 12:00	XV71A	PCBs
BP2WQ-0330	01/15/14 12:23	XV71B	PCBs
BP2WQ-0321	01/14/14 12:52	XV71C	PCBs
BP2WQ-0340	01/17/14 13:22	XW12A	PCBs
BP2WQ-0332	01/16/14 12:15	XW79A	PCBs
BP2WQ-0335	01/16/14 13:07	XW79B	PCBs
BP2WQ-0341	01/17/14 13:42	XY16A	PCBs
BP2WQ-0345	01/21/14 12:44	XV56B/XV56I	PCBs, total and dissolved mercury

Validation: A summary validation was performed for these analyses. Validation was performed by Cari Sayler. Data qualifiers are summarized in section 4.0 of this report.

Analytical methods: Table 6 of the QAPP specifies the following analytical method:

Analysis	Method
Polychorinated Biphenyls	EPA 8082
Mercury	EPA 7471A

These methods were used with the following exceptions: The most recent version of the method for PCB (8082A) was used. The water version of the mercury method (7470A) was used. The method substitution was considered acceptable.

Requested analyses: Sample chain-of-custodies were reviewed. All requested analyses were performed.

Sample number transcription: Sample IDs in the electronic data deliverable (EDD) were compared to the chain-of-custody for each sample. All ARI sample IDs matched the chain of custody.

2.0 PCB Analyses

Quality control analysis frequencies: The QAPP specifies that the following quality control samples be analyzed one per analytical batch or one per twenty samples, whichever is more frequent: method blank, and laboratory control sample (LCS). A matrix spike (MS) and MS duplicate (MSD) must be analyzed one per twenty samples and a regional reference material (RRM) must be analyzed one per fifty samples. In addition, surrogate compounds must be measured in each field and quality control sample. Field quality control sample requirements include field duplicates and rinse blanks once per sampling round.

Each batch included a method blank, LCS, LCS duplicate and appropriate surrogates. One field duplicate (BP2WQ-0302) and one rinse blank (BP2WQ-0294) were also analyzed and discussed in an earlier report. No qualifiers are added based on the lack of MS/MSD and RRM samples.

Holding times: Water samples must be extracted within 7 days of collection. Extracts must be analyzed within 40 days of extraction. All analyses except BP2WQ-0337 were requested after the extraction holding times were exceeded. Holding times were as follows:

Field ID	Days Sampling to Extraction	Days Extraction to Analysis
BP2WQ-0321	9	1
BP2WQ-0330	8	1
BP2WQ-0332	18	1
BP2WQ-0335	18	1
BP2WQ-0337	6	1
BP2WQ-0340	12	0
BP2WQ-0341	19	1

Results in all samples except BP2WQ-0337 are qualified as estimated.

Instrument calibration: Data usability criteria for calibrations include minimum correlation coefficients (R^2) of 0.990 or maximum RSDs of $\pm$20% for each initial calibration, and maximum % differences of $\pm$25% for each continuing calibration. All initial calibration compound RSDs were within 20%. Continuing calibration % differences were within $\pm$25%.

Laboratory blank results: Criteria for blanks are that analyte concentrations must be below the RL, or below 10% of the lowest associated sample concentration. These criteria were met.

Surrogate recoveries: QAPP control limits were 34-141%. Surrogate recoveries were within QAPP and laboratory control limits.

LCS recoveries: QAPP control limits were 37-116%. LCS recoveries were within QAPP and laboratory control limits.

LCS/LCSD RPDs: QAPP control limits were 50%. RPDs were within QAPP and laboratory control limits.

Reporting limits: RLs for various aroclors were elevated above 0.01 ug/L due to chromatographic overlap with other aroclors. These samples also contained detected aroclors and the impact on the total PCB value was minimal. No qualifiers are assigned on the basis of elevated reporting limits.

Laboratory narrative and qualifiers: Various results are flagged Y to indicate elevated reporting limits. These results are qualified "UY" to clarify that the aroclor was not detected. No additional qualifiers are assigned based on a review of the laboratory narrative.

Overall assessment: Documentation was found to be clear and complete. Calibration data demonstrate acceptable instrument performance. Laboratory control sample results demonstrate acceptable accuracy and precision. Samples were estimated due to exceeded holding time criteria.

PCB data are acceptable for use as qualified.

3.0 Total and Dissolved Mercury Analyses

Quality control analysis frequencies: The QAPP specifies that the following quality control samples be analyzed one per analytical batch or one per twenty samples, whichever is more frequent: method blank, and laboratory control sample (LCS). A matrix spike (MS) and MS duplicate (MSD) or laboratory duplicate must be analyzed one per twenty samples. Field quality control sample requirements include field duplicates, filter blanks and rinse blanks once per sampling round.

This batch included a method blank, LCS, MS and laboratory duplicate. The field blank and field duplicate were analyzed in a previous batch, meeting project requirements.

Holding times: Total or dissolved mercury samples must be analyzed within 28 days of collection. Samples were analyzed within the holding time.

Instrument calibration: Functional guidelines criterion for calibration verifications is a maximum % difference of ±15%. QAPP criterion for calibration verifications is ±20%. These criteria were met.

Laboratory and field blank results: Criteria for calibration and method blanks are that analyte concentrations must be below the RL, or below 10% of the lowest associated sample concentration. No contamination was detected in the method or calibration blanks.

LCS recoveries: QAPP control limits were 80-120%. LCS recoveries were within QAPP and laboratory control limits.

MS recoveries: QAPP control limits were 80-120%. MS recoveries were within QAPP and laboratory control limits with the following exception:

QC ID	Analyte	% Recovery	Lab Control Limit
BP2WQ-0345MS	Mercury	187	75 - 125

According to the laboratory narrative, the high mercury percent recovery was likely due to a spiking error. Additionally, mercury was not detected in the associated sample, and no qualifiers are assigned.

Laboratory duplicate RPDs: QAPP control limits were <20%. For duplicates with concentrations above five times the reporting limit, RPDs were within QAPP and laboratory control limits. For duplicates with concentrations below five times the reporting limit, absolute differences were within the reporting limit.

Reporting limits: The QAPP specifies target reporting limits of 0.020 ug/L. This limit was met.

Laboratory narrative and qualifiers: No additional qualifiers are assigned based on a review of the laboratory narrative.

Overall assessment: Documentation was found to be clear and complete. Calibration data demonstrate acceptable instrument performance. Quality control sample results demonstrate acceptable accuracy and precision.

Total and dissolved mercury data are acceptable for use as reported.

4.0 Qualifier Summary Table

Client ID	Analyte(s)	Qualifier	Reason
Polychorinated Biphenyl Analyses			
BP2WQ-0321	All	UJ	Hold time exceeded
BP2WQ-0330	All	UJ	Hold time exceeded
BP2WQ-0332	Aroclor 1248, Aroclor 1254	UJY	Hold time exceeded, Clarification of Y flag
BP2WQ-0332	Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242	UJ	Hold time exceeded
BP2WQ-0332	Aroclor 1260	J	Hold time exceeded
BP2WQ-0335	All	UJ	Hold time exceeded
BP2WQ-0337	Aroclor 1254	UY	Clarification of Y flag
BP2WQ-0340	All	UJ	Hold time exceeded
BP2WQ-0341	All	UJ	Hold time exceeded
BP2WQ-0345	Aroclor 1232, Aroclor 1254	UY	Clarification of Y flag

5.0 Abbreviations and Definitions

DV Qualifier	Definition
U	The material was analyzed for, but was not detected above the level of the associated value.
UY	The reporting limit was elevated due to chromatographic overlap with related compounds. The material was analyzed for, but was not detected above the level of the associated value.
J	The analyte was positively identified. The associated numerical value is the approximate concentration of the analyte in the sample.

DV Qualifier	Definition
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
UJ	The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	The sample result is rejected. The presence or absence of the analyte cannot be verified and data are not usable.
R1	This sample result has been rejected in favor of a more accurate and/or precise result. The other result should be used.

Abbreviation	Definition
DV	Data validation
LCS	Laboratory control sample
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RPD	Relative percent difference
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RSD	Relative standard deviations
SRM	Standard reference material
Surr	Surrogate

6.0 References

USEPA Contract Laboratory Program National Functional Guidelines For Superfund Organic Methods Data Review, Office of Superfund Remediation and Technology Innovation, U.S. Environmental Protection Agency, June 2008, USEPA-540-R-008-01.

USEPA Contract Laboratory Program National Functional Guidelines For Inorganic Superfund Data Review, Office of Superfund Remediation and Technology Innovation, U.S. Environmental Protection Agency, January 2010, USEPA-540-R-10-011.

Water Quality Monitoring, Quality Assurance Project Plan, Duwamish Sediment Other Area and Southwest Bank Corrective Measure and Habitat Project, Boeing Plant 2. Prepared by AMEC Environment & Infrastructure Inc., et al. Prepared for: The Boeing Company, December 2012.

Dissolved Metals

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DATA VALIDATION REPORT

Boeing Plant 2 Water Quality Samples – January 2014

Prepared for:
AMEC Environment & Infrastructure, Inc.
3500 188th Street SW, Ste 601
Lynnwood, WA 98037-4763

March 30, 2014

1.0 Introduction

Data validation was performed on the following Applied Speciation and Consulting, LLC samples:

Sample ID	Sample Date	Lab Report #	Total ICP-MS Metals	Dissolved ICP-MS Metals
BP2WQ-0250	1/7/14 20:40	L140109		X
BP2WQ-0252	1/10/14 5:35	L140116		X
BP2WQ-0270	1/3/14 12:34	L140109		X
BP2WQ-0285	1/6/14 15:48	L140109		X
BP2WQ-0293	1/7/14 14:40	L140109		X
BP2WQ-0301	1/8/14 15:17	L140109		X
BP2WQ-0302	1/8/14 15:17	L140109		X
BP2WQ-0319	1/14/14 11:43	L140116		X
BP2WQ-0327	1/15/14 10:57	L140116		X
BP2WQ-0336	1/17/14 11:42	L140120		X
BP2WQ-0345	1/21/14 12:44	L140122		X
Settlement Basin 011014	1/10/14 21:45	L140116	X	X

Validation: A summary validation was performed for these analyses. Validation was performed by Cari Sayler. Data qualifiers are summarized in section 3.0 of this report.

Analytical methods: Table 6 of the QAPP specifies the following analytical methods method 6020 for total and dissolved metals. Total and dissolved metals were analyzed by ICP-MS utilizing collision reaction cell and referencing EPA method 200.8. This method substitution was considered acceptable.

Requested analyses: Sample chain-of-custodies documented submitted samples, but did not specify which samples should be analyzed. No client communications

documenting samples specified for analysis were included in the laboratory report, and requested analyses could not be reviewed.

Sample number transcription: Sample IDs in the electronic data deliverable (EDD) were compared to the chain-of-custody for each sample. All sample IDs matched the chain of custody.

2.0 Total and Dissolved Metals Analyses

Quality control analysis frequencies: The QAPP specifies that the following quality control samples be analyzed one per analytical batch or one per twenty samples, whichever is more frequent: method blank, and laboratory control sample (LCS). A matrix spike (MS) and MS duplicate (MSD) or laboratory duplicate must be analyzed one per twenty samples. Field quality control sample requirements include field duplicates, filter blanks once per sampling round. These frequencies were met.

Holding times: Samples must be analyzed with 180 days. Holding times were met.

Instrument calibration: The QAPP specifies a coefficient of variation > 0.995 for the initial calibration. The QAPP and functional guidelines criteria for calibration verifications is a maximum % difference of ±10%. The coefficient of variations met criteria. These criteria were met with one exception:

Lab Batch	Standard ID	Analyte	% Recovery
L140109	CCV3	Silver	114.9

Silver was not detected in the associated samples, and no qualifiers are required.

Laboratory and field blank results: Criteria for blanks are that analyte concentrations must be below the RL, or below 10% of the lowest associated sample concentration. No metals were detected in the preparation blanks. Additionally, the blank response should not drift below the level of the negative RL. Metals were detected in the calibration and preparation blanks at levels between the MDL and RL and at levels below the negative RL as follows:

Standard ID	Analyte	Result (ug/L)	MDL (ug/L)	RL (ug/L)
L140122-CCB2	Silver	0.0005 J	0.00046	0.0046
L140116-ICB	Chromium	0.046 J	0.017	0.17
L140116-CCB1	Chromium	0.024 J	0.017	0.17
L140116-CCB3	Chromium	0.082 J	0.017	0.17
L140116-CCB4	Chromium	0.017 J	0.017	0.17
L140116-CCB2	Lead	0.009 J	0.0059	0.059
L140122-CCB2	Lead	-0.0506	0.0018	0.018
L140122-CCB3	Lead	-0.0307	0.0018	0.018
L140109-CCB1	Zinc	0.025 J	0.015	0.15
L140109-CCB2	Zinc	0.041 J	0.015	0.15
L140109-CCB3	Zinc	0.024 J	0.015	0.15
L140122-PB1	Zinc	1.4 J	0.20	2.0

For metals detected in the calibration blanks at levels between the MDL and RL,

associated sample results below five times the instrument blank level should be considered not detected at the reported value and are qualified "U". If these values are also below the reporting limit they are also considered estimated and are qualified "UJ". Associated sample results between five and ten times the instrument blank level and should be considered estimated.

For the lead responses which were below the negative RL, associated non-detect results were qualified as estimated, and detections below 4 times the RL are qualified as estimated.

Dissolved Copper was detected in the filter blank at levels between the MDL and RL as follows:

Blank ID	Analyte	Result (ug/L)	MDL (ug/L)	RL (ug/L)
BP2WQ-0293	Dissolved Copper	0.77 J	0.36	3.6

Dissolved copper results below five times the filter blank level and should be considered not detected at the reported value and are qualified "U". If these values are also below the reporting limit they are also considered estimated and are qualified "UJ". Sample results between five and ten times the filter blank level should be considered estimated.

LCS / reference material recoveries: QAPP control limits were 80-120%. LCS recoveries were within QAPP and laboratory control limits with two exceptions:

QC ID	Analyte	% Recovery	Lab Control Limit
L140109 CASS-4	Cadmium	140.4	75 – 125
L140116 CASS-4	Cadmium	161.1	75 – 125

All positive cadmium results in associated samples are qualified as estimated.

MS recoveries: QAPP control limits were 75-125%. MS recoveries were within QAPP and laboratory control limits with the following exceptions:

QC ID	Analyte	% Recovery	Lab Control Limit
BP2WQ-0345 MS	Dissolved Zinc	64.5	75 - 125
BP2WQ-0345 MSD	Dissolved Zinc	64.6	75 - 125

The zinc result in sample BP2WQ-0345 is qualified as estimated.

MS/MSD RPDs: QAPP control limits were <20%. MS/MSD RPDs were within QAPP and laboratory control limits.

Laboratory duplicate RPDs: QAPP control limits were <20%. RPDs were within QAPP and laboratory control limits in duplicates with concentrations above five times the reporting limit. Absolute differences were less than the reporting limit in duplicates with concentrations below five times the reporting limit.

Field duplicate RPDs: Results in the field duplicate and their parent samples were below five times the PQL and concentrations were within +/- the reporting limit.

Reporting limits: The reporting limits initially submitted were statistically derived from four replicate analyses of the preparation blank for each lab batch, and utilized an incorrect Student-T value. All method detection limits (MDL) and reporting limits (RL) are adjusted upwards by factor of 1.5 (4.5/3) with one exception: The individual prep blank values for cadmium in lab SDG L140122 did not match the raw data summary, and that MDL and RL recalculated from the raw data summary.

Additionally, these values reflected the "best case" instrument sensitivity at the beginning of each day's analyses. Where calibration blank values indicate significant decreased instrument sensitivity, concentrations between the corrected MDL and a calibration blank-based MDL are qualified as not detected and estimated at the reported level, "UJ". Concentrations

Table 6 of the QAPP specifies reporting limits between 0.1 and 4.0 ug/L for the six reported metals. The following samples had reporting limits elevated above the QAPP levels:

Sample ID	Analyte	Result (ug/L)	Target RL (ug/L)	Screening Level (ug/L)
BP2WQ-0345	Dissolved Lead	0.627 UJ	0.1	8.1
Settlement Basin 011014	Dissolved Lead	0.15 UJ	0.1	8.1

In each case, the reporting limit was below the screening level, so impact on data usability is minimal. No qualifiers are assigned on the basis of elevated reporting limits.

Overall assessment: Documentation was found to be clear and complete. Calibration standards indicate acceptable instrument performance. Method detection limits and reporting limits were corrected based on calculation errors. MS/MSD results demonstrate acceptable laboratory precision and accuracy. Data were estimated based on reference material and matrix spike recoveries and blank contamination. Reporting limits were elevated due to blank contamination and decreased instrument sensitivity.

Metals data are acceptable for use as qualified.

3.0 Qualifier Summary Table

Client ID	Analyte(s)	Qualifier	Reason
BP2WQ-0252	Dissolved Chromium	UJ	Instrument sensitivity
BP2WQ-0252	Dissolved Cadmium	J	High RM recovery
BP2WQ-0285	Dissolved Zinc	U	Cal. Blank Contamination
BP2WQ-0301	Dissolved Zinc	J	Cal. Blank Contamination
BP2WQ-0345	Dissolved Chromium	UJ	Instrument Sensitivity
BP2WQ-0345	Dissolved Lead	UJ	Cal. Blank Drift, Instrument sensitivity
BP2WQ-0345	Dissolved Zinc	UJ	Blank Contamination, Low MS/D recoveries, Instrument sensitivity
Settlement Basin 011014	Chromium	UJ	Instrument sensitivity
Settlement Basin 011014	Dissolved Lead	U	Cal. Blank contamination

Client ID	Analyte(s)	Qualifier	Reason
Settlement Basin 011014	Cadmium, Dissolved Cadmium	J	High RM recovery

4.0 Abbreviations and Definitions

DV Qualifier	Definition
U	The material was analyzed for, but was not detected above the level of the associated value.
J	The analyte was positively identified. The associated numerical value is the approximate concentration of the analyte in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
UJ	The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	The sample result is rejected. The presence or absence of the analyte cannot be verified and data are not usable.
R1	This sample result has been rejected in favor of a more accurate and/or precise result. The other result should be used.

Abbreviation	Definition
DV	Data validation
LCS	Laboratory control sample
MS	Matrix spike
MSD	Matrix spike duplicate
NA	Not Applicable
RPD	Relative percent difference
RRM	Regional reference material
RSD	Relative standard deviations
SRM	Standard reference material
Surr	Surrogate

5.0 References

USEPA Contract Laboratory Program National Functional Guidelines For Superfund Organic Methods Data Review, Office of Superfund Remediation and Technology Innovation, U.S. Environmental Protection Agency, June 2008, USEPA-540-R-008-01.

USEPA Contract Laboratory Program National Functional Guidelines For Inorganic Superfund Data Review, Office of Superfund Remediation and Technology Innovation, U.S. Environmental Protection Agency, January 2010, USEPA-540-R-10-011.

Water Quality Monitoring, Quality Assurance Project Plan, Duwamish Sediment Other Area and Southwest Bank Corrective Measure and Habitat Project, Boeing Plant 2. Prepared by AMEC Environment & Infrastructure Inc., et al. Prepared for: The Boeing Company, December 2012

PRE-CONSTRUCTION PERIMETER SAMPLE DATA VALIDATION REPORTS

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DATA VALIDATION REPORT

Boeing Plant 2–Perimeter Sediment Monitoring Data – December 2013

Prepared for:
AMEC Environment & Infrastructure, Inc.
3500 188th Street SW, Ste 601
Lynnwood, WA 98037-4763

March 13, 2014

1.0 Introduction

Data validation was performed on the following laboratory data:

Sample ID	Sample Date/Time	Lab ID	Analyses
SD-PER401-1213	12/10/13 08:17	XR01A	PCBs, Metals, TOC, TS
SD-PER402-1213	12/10/13 09:49	XR01B	PCBs, Metals, TOC, TS
SD-PER403-1213	12/10/13 11:07	XR01C	PCBs, Metals, TOC, TS
SD-PER201-1213	12/10/13 13:27	XR01D	PCBs, Metals, TOC, TS
SD-PER202-1213	12/10/13 14:35	XR01E	PCBs, Metals, TOC, TS
SD-PER404-1213	12/11/13 08:02	XR01F	PCBs, Metals, TOC, TS
SD-PER406-1213	12/11/13 09:17	XR01G	PCBs, Metals, TOC, TS
SD-PER426-1213	12/11/13 10:05	XR01H	PCBs, Metals, TOC, TS
SD-PER203-1213	12/11/13 11:56	XR01I	PCBs, Metals, TOC, TS
SD-PER204-1213	12/11/13 12:38	XR01J	PCBs, Metals, TOC, TS
SD-PER205-1213	12/11/13 13:34	XR01K	PCBs, Metals, TOC, TS
SD-PER405-1213	12/12/13 08:04	XR34A	PCBs, Metals, TOC, TS
SD-PER206-1213	12/12/13 09:05	XR34B	PCBs, Metals, TOC, TS
SD-PER207-1213	12/12/13 09:52	XR34C	PCBs, Metals, TOC, TS
SD-PER208-1213	12/12/13 11:55	XR34D	PCBs, Metals, TOC, TS
SD-PER209-1213	12/12/13 12:42	XR34E	PCBs, Metals, TOC, TS
SD-PER101-1213	12/13/13 07:55	XR34F	PCBs, Metals, TOC, TS
SD-PER106-1213	12/13/13 08:50	XR34G	PCBs, Metals, TOC, TS
SD-PER126-1213	12/13/13 09:31	XR34H	PCBs, Metals, TOC, TS
SD-PER210-1213	12/13/13 11:21	XR34I	PCBs, Metals, TOC, TS
SD-PER230-1213	12/13/13 12:07	XR34J	PCBs, Metals, TOC, TS
SD-PER301-1213	12/13/13 13:01	XR34K	PCBs, Metals, TOC, TS
SD-PER302-1213	12/16/13 08:01	XR75A	PCBs, Metals, TOC, TS
SD-PER303-1213	12/16/13 08:45	XR75B	PCBs, Metals, TOC, TS
SD-PER312-1213	12/16/13 09:35	XR75C	PCBs, Metals, TOC, TS
SD-PER305-1213	12/16/13 10:21	XR75D	PCBs, Metals, TOC, TS
SD-PER313-1213	12/16/13 11:50	XR75E	PCBs, Metals, TOC, TS
SD-PER307-1213	12/16/13 12:25	XR75F	PCBs, Metals, TOC, TS
SD-PER327-1213	12/16/13 13:03	XR75G	PCBs, Metals, TOC, TS
SD-PER213-1213	12/17/13 09:30	XR75H	PCBs, Metals, TOC, TS
SD-PER212-1213	12/17/13 10:05	XR75I	PCBs, Metals, TOC, TS

Sample ID	Sample Date/Time	Lab ID	Analyses
SD-PER103-1213	12/17/13 10:55	XR75J	PCBs, Metals, TOC, TS
SD-PER102-1213	12/17/13 12:02	XR75K	PCBs, Metals, TOC, TS
SD-PER104-1213	12/17/13 12:58	XR75L	PCBs, Metals, TOC, TS
SD-PER308-1213	12/19/13 08:28	XS31A	PCBs, Metals, TOC, TS
SD-PER309-1213	12/19/13 09:22	XS31B	PCBs, Metals, TOC, TS
SD-PER310-1213	12/19/13 10:06	XS31C	PCBs, Metals, TOC, TS
SD-PER105-1213	12/19/13 12:21	XS31D	PCBs, Metals, TOC, TS
SD-PER211-1213	12/19/13 13:01	XS31E	PCBs, Metals, TOC, TS
SD-PER306-1213	12/19/13 13:52	XS31F	PCBs, Metals, TOC, TS
SD-PER311-1213	12/20/13 10:06	XS31G	PCBs, Metals, TOC, TS
SD-PER314-1213	12/20/13 12:48	XS31H	PCBs, Metals, TOC, TS

Analyses were performed by Analytical Resources, Inc. in Tukwila, Washington.

Validation: A summary validation was performed for these analyses. Validation was performed by Cari Sayler. Data qualifiers are summarized in section 5.0 of this report.

Analytical methods: Table 1 and table 2 of the QAPP specify the following analytical methods:

Analysis	Method
Polychorinated Biphenyls	EPA 8082 with 3665B/3660B cleanups
Metals(except mercury)	EPA 6010
Mercury	EPA 7471A
Total Organic Carbon	EPA 9060
Total Solids	160.1

These methods were used with the following exceptions: The most recent version of the methods for PCB (8082A) was used. ICP metals were analyzed by method 200.8. Soil Total Organic Carbon (TOC) analyses were performed by Plumb, 1981, and Total solids analyses were performed by EPA method 2540B. These are considered acceptable substitutions. Additionally, PCB cleanups included silica gel in addition to the specified sulfur and acid cleanups for all soil samples except those in SDG XR34.

Sample Receipt: Sample chain-of-custodies were reviewed. Requested analyses were performed.

Sample number transcription: Sample IDs in the electronic data deliverable (EDD) were compared to the chain-of-custody for each sample. Sample IDs matched the chain of custody with one exception: Sample XR75D was listed on the chain of custody as SD-PER304-1213 and was changed to SD-PER305-1213 based upon communication from the client.

2.0 PCB Analyses

Quality control analysis frequencies: The QAPP specifies that the following quality control samples be analyzed one per analytical batch or one per twenty samples, whichever is more frequent: method blank, and laboratory control sample (LCS). A matrix spike (MS) and MS duplicate (MSD) must be analyzed one per twenty

samples and a regional reference material (RRM) must be analyzed one per fifty samples. In addition, surrogate compounds must be measured in each field and quality control sample. These frequencies were met.

Field quality control sample requirements include field duplicates at a 10% frequency. Four field duplicates were analyzed, meeting this requirement.

Holding times: Refrigerated sediment samples must be extracted within 14 days of collection. Frozen sediment samples must be extracted within 1 year of collection. Extracts must be analyzed within 40 days of extraction. These holding times were met.

Instrument calibration: Data usability criteria for calibrations include minimum correlation coefficients (R^2) of 0.990 or maximum RSDs of $\pm$20% for each initial calibration, and maximum % differences of $\pm$25% for each continuing calibration. These criteria were met.

Laboratory blank results: Criteria for blanks are that analyte concentrations must be below the RL, or below 10% of the lowest associated sample concentration. These criteria were met.

Surrogate recoveries: QAPP control limits were 34-141%. Surrogate recoveries are not evaluated in samples with dilution factors of 10 or more. The remaining surrogate recoveries were within QAPP and laboratory control limits with the following exception:

Sample ID	Surrogate	% Recovery	Lab Control Limit
SD-PER426-1213	Tetrachlorometaxylene	55.2	57.0 - 109

The surrogate recovery is within the QAPP control limit, and the decachlorobiphenyl recovery for this sample is within both limits. No qualifiers are assigned.

LCS recoveries: QAPP control limits were 37-116%. LCS recoveries were within QAPP and laboratory control limits.

RRM recoveries: RRM Aroclor 1260 results ranged from 110 to 130 ug/kg. Both of the SRMs were within the advisory limits of 38-167%.

MS recoveries: QAPP control limits were 37-116%. Negative recoveries for Aroclor 1260 were observed in the MS and MSD performed on sample SD-PER314-1213. Sample inhomogeneity may have contributed to the poor recoveries, and the Aroclor 1260 result in this sample is qualified as estimated. All other recoveries were within QAPP and laboratory control limits.

MS/MSD RPDs: QAPP control limits were 50%. RPDs were within QAPP and laboratory control limits.

Field duplicate RPDs: Field duplicate RPDs were below 50% where the concentrations were above five times the reporting limit with the following exception:

FD ID / Sample ID	Analyte	FD Result (ug/kg)	Sample Result (ug/kg)	RPD
SD-PER126-1213 / SD-PER106-1213	Aroclor 1254	94	190	67.6

SD-PER126-1213 / SD-PER106-1213	Aroclor 1260	64	200	103
SD-PER426-1213 / SD-PER406-1213	Aroclor 1260	21	39	60.0

This analyte are qualified as estimated in the field duplicates and parent sample.

Field duplicate concentrations were within +/- two times the reporting limit where concentrations were below five times the reporting limit.

Multiple reported results: Unless quality control results warrant the rejection of one result, multiple reported results are evaluated according to the following guidelines

(1) If both results are non-detects, the lower reporting limit was selected.
(2) If one result was not detected and the other detected, the detection was selected.
(3) If both results were detections, the following additional criteria were applied:
(a) If one result was off-scale and one was on-scale, the on-scale result was selected.
(b) If associated QC results indicated high bias, the lower concentration result was selected.
(c) If associated QC results indicated no, low, or mixed biases, the higher concentration result was selected.

This approach is conservative, and is considered most protective of the environment. The results not selected as the best result to report are qualified R1, rejected due to the availability of better results.

Samples with dilutions were reduced to a single result.

Laboratory flags: Various results are flagged Y to indicate elevated reporting limits. These results are qualified "UY" to clarify that the aroclor was not detected. Aroclor 1254 in sample SD-PER307-1213, was flagged P to indicate the dual column RPD exceeded 40%. This result is qualified as estimated.

Reporting limits: RLs for various aroclors were elevated above 20 ug/Kg due to chromatographic overlap with other aroclors and necessary dilution. These samples also contained detected aroclors and the impact on the total PCB value was minimal. No qualifiers are assigned on the basis of elevated reporting limits.

Overall assessment: Documentation was found to be clear and complete. Calibration data demonstrate acceptable instrument performance. Laboratory control sample results demonstrate acceptable accuracy and precision. Multiple analysis results were reduced to the most appropriate to use. Results were estimated due to MS/D recoveries, field duplicate variability, and dual column variability.

Except for data replaced by another result, PCB data are acceptable for use as qualified.

3.0 Metals Analyses

Quality control analysis frequencies: The QAPP specifies that the following quality control samples be analyzed one per analytical batch or one per twenty samples,

whichever is more frequent: method blank, and laboratory control sample (LCS). A matrix spike (MS) and laboratory duplicate must be analyzed one per twenty samples. These frequencies were met.

Field quality control sample requirements include field duplicates at a 10% frequency. Four field duplicates were analyzed, meeting this requirement.

Holding times: Total or dissolved mercury samples must be analyzed within 28 days of collection. Other metals samples must be analyzed with 180 days. These criteria were met.

Instrument calibration: Functional guidelines criteria for calibration verifications is a maximum % difference of ±10% for ICP metals and ±20% for mercury. Criteria for calibration blanks are that analyte concentrations must be between the negative RL and the positive RL. Functional guidelines criterion for detection limit standard recovery is 70-130%, and the QAPP specifies this standard must be within one RL of the true value. These criteria were met for all calibration verifications and blanks. Detection limit standard recoveries were within 70-130%.

Laboratory blank results: Criteria for method blanks are that analyte concentrations must be below the PQL, or below 10% of the lowest associated sample concentration. No contamination was detected in the method blanks.

LCS recoveries: QAPP control limits were 80-120%. LCS recoveries were within QAPP and laboratory control limits.

SRM recoveries: SRM concentrations were within the advisory range.

MS recoveries: QAPP control limits were 75-125%. Functional guidelines criteria for both ICP metals and mercury are 75-125%. MS recoveries were within QAPP and laboratory control limits.

Laboratory duplicate RPDs: QAPP control limits were <20%. For duplicates with concentrations above five times the reporting limit, RPDs were within QAPP and laboratory control limits.

For sample/duplicate pairs with concentrations below five times the reporting limit, absolute differences were within the reporting limit with one exception:

QC ID	Analyte	Duplicate Result (mg/kg)	Sample Result (mg/kg)	RL (mg/kg)
SD-PER405-1213LR	Lead	11	18	4

This result is qualified as estimated.

Field duplicate RPDs: Field duplicate RPDs were below 20% where the concentrations were above five times the reporting limit with the following exceptions:

FD ID	Analyte	FD Result (mg/kg)	Sample Result (mg/kg)	RPD
SD-PER126-1213 / SD-PER106-1213	Arsenic	13.2	8.1	47.9
SD-PER327-1213 / SD-PER307-1213	Arsenic	9.8	13.3	30.3

FD ID	Analyte	FD Result (mg/kg)	Sample Result (mg/kg)	RPD
SD-PER426-1213 / SD-PER406-1213	Arsenic	7.7	9.8	24.0

These analytes are qualified as estimated in the field duplicate and parent sample.

Field duplicate concentrations were within +/- two times the reporting limit where concentrations were below five times the reporting limit with one exception:

FD ID	Analyte	FD Result (mg/kg)	Sample Result (mg/kg)	RL (mg/kg)
SD-PER230-1213 / SD-PER210-1213	Mercury	0.31	0.09	0.04

This analyte is qualified as estimated in the field duplicate and parent sample.

Reporting limits: Some RLs were elevated above QAPP levels due to dry weight calculation or sample dilution:

Analyte	QAPP specified RL (mg/kg)	Highest Reported RL (mg/kg	SMS SQS (mg/kg)
Cadmium	0.2	0.5	5.1
Mercury	0.025	0.05	0.41
Silver	0.3	0.8	6.1

Each elevated RL was below the screening level and the impact on data use is minimal. No qualifiers are assigned on the basis of elevated reporting limits.

Overall assessment: Documentation was found to be clear and complete. Calibration data demonstrate acceptable instrument performance. Method blank, LCS, SRM, and MS results demonstrate acceptable accuracy. Data were estimated based on laboratory and field duplicate variability.

Metals data are acceptable for use as qualified.

4.0 General Chemistry Analyses

Quality control analysis frequencies: For total organic carbon, a method blank, SRM, and LCS were analyzed in each batch. Two of the four batches also included a MS and laboratory triplicate. One of the two included a second MS and second laboratory triplicate. For total solids, each batch included a method blank and laboratory triplicate. One batch also included a second laboratory triplicate. Four field duplicates were also analyzed. Quality control samples were sufficient to evaluate precision and accuracy as appropriate for the method.

Holding times: Holding times are as follows:

Analysis	Holding time if refrigerated	Holding time if frozen
TOC	28 days	6 months
Total Solids	14 days	6 months

Samples were analyzed within the holding times.

Instrument calibration: Instrument calibration criteria are as follows:

Analysis	Criteria
TOC	Initial calibration $R^2 > 0.990$ Continuing calibration recovery within 90-110%
Total Solids	Calibration mass within ± 0.1 g

These criteria were met.

Laboratory blank results: Criteria for method blanks are that analyte concentrations must be below the PQL, or below 10% of the lowest associated sample concentration. This criterion was met for all method blanks.

LCS recoveries: Control limits were 75-125% for TOC. These criteria were met.

SRM results: Control limits ranged from 75-125 to 80-120% for TOC. These criteria were met.

MS recoveries: Control limits were 75-125% for TOC. These criteria were met with the following exception:

QC ID	Analyte	% Recovery	Lab Control Limit
SD-PER405-1213MS	Total Organic Carbon	129.3	75.0 - 125

The TOC result is qualified as estimated in the native sample.

Laboratory duplicate and triplicate results: Control limits were 20% for TOC and total solids. These criteria were met.

Field duplicate results: TOC and total solids field duplicate RPDs were below 20%.

Overall assessment: Documentation was found to be clear and complete. Calibration data indicate acceptable performance. Method blank, LCS, and SRM results demonstrate acceptable laboratory accuracy. Laboratory and field duplicate results demonstrate acceptable precision. One data point was estimated based on high matrix spike recovery.

General chemistry results are acceptable for use as qualified.

5.0 Qualifier Summary Table

Client ID	Analyte(s)	Qualifier	Reason
Polychlorinated Biphenyl Analyses			
SD-PER101-1213	Aroclor 1248	UY	Clarification of Y flag
SD-PER102-1213	Aroclor 1248	UY	Clarification of Y flag
SD-PER103-1213	Aroclor 1248	UY	Clarification of Y flag
SD-PER104-1213	Aroclor 1248	UY	Clarification of Y flag
SD-PER106-1213	Aroclor 1254, Aroclor 1260	J	High FD RPD
SD-PER106-1213	Aroclor 1248	UY	Clarification of Y flag
SD-PER209-1213	Aroclor 1232	UY	Clarification of Y flag
SD-PER210-1213	Aroclor 1248	UY	Clarification of Y flag
SD-PER211-1213	Aroclor 1254, Aroclor 1260	R1	Another result available
SD-PER211-1213 DL	All except Aroclor 1254, Aroclor 1260	R1	Another result available

Client ID	Analyte(s)	Qualifier	Reason
SD-PER212-1213	Aroclor 1248	UY	Clarification of Y flag
SD-PER213-1213	Aroclor 1248	UY	Clarification of Y flag
SD-PER302-1213	Aroclor 1248	UY	Clarification of Y flag
SD-PER303-1213	Aroclor 1248	UY	Clarification of Y flag
SD-PER305-1213	Aroclor 1248	UY	Clarification of Y flag
SD-PER307-1213	Aroclor 1248	UY	Clarification of Y flag
SD-PER307-1213	Aroclor 1254	J	High dual column RPD
SD-PER312-1213	Aroclor 1248	UY	Clarification of Y flag
SD-PER313-1213	Aroclor 1248	UY	Clarification of Y flag
SD-PER314-1213	Aroclor 1260	J	Negative MS/D Recovery
SD-PER314-1213	Aroclor 1232	UY	Clarification of Y flag
SD-PER327-1213	Aroclor 1248	UY	Clarification of Y flag
SD-PER405-1213	Aroclor 1248	UY	Clarification of Y flag
SD-PER406-1213	Aroclor 1260	J	High FD RPD
Metals Analyses			
SD-PER106-1213	Arsenic	J	High FD RPD
SD-PER210-1213	Mercury	J	High FD Difference
SD-PER307-1213	Arsenic	J	High FD RPD
SD-PER405-1213	Lead	J	High LD Difference
SD-PER406-1213	Arsenic	J	High FD RPD
General Chemistry Analyses			
SD-PER405-1213	Total Organic Carbon	J	High MS recovery

6.0 Abbreviations and Definitions

DV Qualifier	Definition
U	The material was analyzed for, but was not detected above the level of the associated value.
UY	The reporting limit was elevated due to chromatographic overlap with related compounds. The material was analyzed for, but was not detected above the level of the associated value.
J	The analyte was positively identified. The associated numerical value is the approximate concentration of the analyte in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
UJ	The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	The sample result is rejected. The presence or absence of the analyte cannot be verified and data are not usable.
R1	This sample result has been rejected in favor of a more accurate and/or precise result. The other result should be used.

Abbreviation	Definition
DV	Data validation
LCS	Laboratory control sample
MS	Matrix spike
MSD	Matrix spike duplicate
NA	Not Applicable
RL	Reporting limit
RPD	Relative percent difference
RRM	Regional reference material
RSD	Relative standard deviations
SRM	Standard reference material

7.0 References

USEPA Contract Laboratory Program National Functional Guidelines For Superfund Organic Methods Data Review, Office of Superfund Remediation and Technology Innovation, U.S. Environmental Protection Agency, June 2008, USEPA-540-R-008-01.

USEPA Contract Laboratory Program National Functional Guidelines For Inorganic Superfund Data Review, Office of Superfund Remediation and Technology Innovation, U.S. Environmental Protection Agency, January 2010, USEPA-540-R-10-011.

Construction and Post-Construction Sediment Monitoring Quality Assurance Project Plan, Duwamish Sediment Other Area and Southwest Bank Corrective Measure and Habitat Project, Boeing Plant 2. Prepared by AMEC Environment & Infrastructure Inc., et al. Prepared for: The Boeing Company, December 2012

South Shoreline Subsurface Environmental Characterization Quality Assurance Project Plan, Duwamish Sediment Other Area and Southwest Bank Corrective Measure and Habitat Project, Boeing Plant 2. Prepared by AMEC Environment & Infrastructure Inc., et al. Prepared for: The Boeing Company, June 2013

POST-CONSTRUCTION PERIMETER SAMPLE DATA VALIDATION REPORTS

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DATA VALIDATION REPORT

Boeing Plant 2–Post Construction Perimeter Data – March 2014

Prepared for:
AMEC Environment & Infrastructure, Inc.
3500 188th Street SW, Ste 601
Lynnwood, WA 98037-4763

April 26, 2014

1.0 Introduction

Data validation was performed on the following laboratory data:

SampleID	Sample Date/Time	LabID	Analyses
SD-PER101-0314	03/12/1471 11:08	14-4131-YC57C	PCBs, Metals, TOC, TS
SD-PER102-0314	03/13/1472 13:29	14-4425-YC98K	PCBs, Metals, TOC, TS
SD-PER103-0314	03/12/1471 12:22	14-4132-YC57D	PCBs, Metals, TOC, TS
SD-PER104-0314	03/12/1471 13:03	14-4133-YC57E	PCBs, Metals, TOC, TS
SD-PER105-0314	03/13/1472 14:13	14-4426-YC98L	PCBs, Metals, TOC, TS
SD-PER106-0314	03/13/1472 11:34	14-4423-YC98I	PCBs, Metals, TOC, TS
SD-PER126-0314	03/13/1472 12:44	14-4424-YC98J	PCBs, Metals, TOC, TS
SD-PER201-0314	03/14/1473 14:06	14-4419-YC98E	PCBs, Metals, TOC, TS
SD-PER202-0314	03/14/1473 14:59	14-4420-YC98F	PCBs, Metals, TOC, TS
SD-PER203-0314	03/14/1473 10:08	14-4416-YC98B	PCBs, Metals, TOC, TS
SD-PER204-0314	03/17/1476 10:15	14-4646-YD22B	PCBs, Metals, TOC, TS
SD-PER205-0314	03/17/1476 11:04	14-4647-YD22C	PCBs, Metals, TOC, TS
SD-PER206-0314	03/14/1473 11:00	14-4417-YC98C	PCBs, Metals, TOC, TS
SD-PER207-0314	03/17/1476 12:45	14-4648-YD22D	PCBs, Metals, TOC, TS
SD-PER208-0314	03/17/1476 14:22	14-4649-YD22E	PCBs, Metals, TOC, TS
SD-PER209-0314	03/14/1473 12:23	14-4418-YC98D	PCBs, Metals, TOC, TS
SD-PER210-0314	03/21/1480 14:20	14-5122-YD87E	PCBs, Metals, TOC, TS
SD-PER211-0314	03/17/1476 15:06	14-4650-YD22F	PCBs, Metals, TOC, TS
SD-PER212-0314	03/24/1483 08:46	14-5282-YE10A	PCBs, Metals, TOC, TS
SD-PER213-0314	03/24/1483 09:33	14-5283-YE10B	PCBs, Metals, TOC, TS
SD-PER230-0314	03/21/1480 15:07	14-5123-YD87F	PCBs, Metals, TOC, TS
SD-PER301-0314	03/14/1473 09:01	14-4415-YC98A	PCBs, Metals, TOC, TS
SD-PER302-0314	03/13/1472 09:42	14-4422-YC98H	PCBs, Metals, TOC, TS
SD-PER303-0314	03/13/1472 08:56	14-4421-YC98G	PCBs, Metals, TOC, TS
SD-PER304-0314	03/17/1476 08:45	14-4645-YD22A	PCBs, Metals, TOC, TS
SD-PER305-0314	03/11/1470 11:25	14-4136-YC57H	PCBs, Metals, TOC, TS
SD-PER306-0314	03/11/1470 12:15	14-4137-YC57I	PCBs, Metals, TOC, TS
SD-PER307-0314	03/11/1470 14:33	14-4139-YC57K	PCBs, Metals, TOC, TS
SD-PER308-0314	03/11/1470 15:44	14-4140-YC57L	PCBs, Metals, TOC, TS

SampleID	Sample Date/Time	LabID	Analyses
SD-PER309-0314	03/21/1480 12:48	14-5121-YD87D	PCBs, Metals, TOC, TS
SD-PER310-0314	03/12/1471 14:25	14-4134-YC57F	PCBs, Metals, TOC, TS
SD-PER311-0314	03/12/1471 15:13	14-4135-YC57G	PCBs, Metals, TOC, TS
SD-PER312-0314	03/12/1471 08:58	14-4129-YC57A	PCBs, Metals, TOC, TS
SD-PER313-0314	03/12/1471 09:48	14-4130-YC57B	PCBs, Metals, TOC, TS
SD-PER327-0314	03/11/1470 13:15	14-4138-YC57J	PCBs, Metals, TOC, TS
SD-PER401-0314	03/21/1480 09:13	14-5118-YD87A	PCBs, Metals, TOC, TS
SD-PER402-0314	03/21/1480 10:23	14-5119-YD87B	PCBs, Metals, TOC, TS
SD-PER403-0314	03/24/1483 10:51	14-5284-YE10C	PCBs, Metals, TOC, TS
SD-PER404-0314	03/21/1480 11:11	14-5120-YD87C	PCBs, Metals, TOC, TS
SD-PER405-0314	03/24/1483 11:34	14-5285-YE10D	PCBs, Metals, TOC, TS
SD-PER406-0314	03/24/1483 12:48	14-5286-YE10E	PCBs, Metals, TOC, TS
SD-PER426-0314	03/24/1483 13:29	14-5287-YE10F	PCBs, Metals, TOC, TS

Analyses were performed by Analytical Resources, Inc. in Tukwila, Washington.

Validation: A summary validation was performed for these analyses. Validation was performed by Cari Sayler. Data qualifiers are summarized in section 5.0 of this report.

Analytical methods: Table 1 and table 2 of the QAPP specify the following analytical methods:

Analysis	Method
Polychorinated Biphenyls	EPA 8082 with 3665B/3660B cleanups
Metals(except mercury)	EPA 6010
Mercury	EPA 7471A
Total Organic Carbon	EPA 9060
Total Solids	160.1

These methods were used with the following exceptions: The most recent version of the methods for PCB (8082A) was used. Arsenic was analyzed by method 200.8. Soil Total Organic Carbon (TOC) analyses were performed by Plumb, 1981, and Total solids analyses were performed by EPA method 2540G. These are considered acceptable substitutions. Additionally, PCB cleanups included silica gel in addition to the specified sulfur and acid cleanups.

Sample Receipt: Sample chain-of-custodies were reviewed. Requested analyses were performed.

Sample number transcription: Sample IDs in the electronic data deliverable (EDD) were compared to the chain-of-custody for each sample. Sample IDs matched the chain of custody.

2.0 PCB Analyses

Quality control analysis frequencies: The QAPP specifies that the following quality control samples be analyzed one per analytical batch or one per twenty samples, whichever is more frequent: method blank, and laboratory control sample (LCS). A matrix spike (MS) and MS duplicate (MSD) must be analyzed one per twenty samples and a regional reference material (RRM) must be analyzed one per fifty

samples. In addition, surrogate compounds must be measured in each field and quality control sample. These frequencies were met.

Field quality control sample requirements include field duplicates at a 10% frequency. Four field duplicates were analyzed, meeting this requirement.

Holding times: Refrigerated sediment samples must be extracted within 14 days of collection. Frozen sediment samples must be extracted within 1 year of collection. Extracts must be analyzed within 40 days of extraction. These holding times were met.

Instrument calibration: Data usability criteria for calibrations include minimum correlation coefficients (R^2) of 0.990 or maximum RSDs of ±20% for each initial calibration, and maximum % differences of ±25% for each continuing calibration. These criteria were met.

Laboratory blank results: Criteria for blanks are that analyte concentrations must be below the RL, or below 10% of the lowest associated sample concentration. These criteria were met.

Surrogate recoveries: QAPP control limits were 34-141%. Surrogate recoveries were within QAPP and laboratory control limits.

LCS recoveries: QAPP control limits were 37-116%. LCS recoveries were within QAPP and laboratory control limits.

RRM recoveries: RRM Aroclor 1260 result was 120 ug/kg. This result is within the advisory limits of 38-167%.

MS recoveries: QAPP control limits were 37-116%. MS other recoveries were within QAPP and laboratory control limits with one exception:

QC ID	Analyte	% Recovery	Lab Control Limit
SD-PER212-0314MS	Aroclor 1260	14.8	29 - 149

Aroclor 1260 is qualified as estimated in the native sample.

MS/MSD RPDs: QAPP control limits were 50%. RPDs were within QAPP and laboratory control limits with one exception:

QC ID	Analyte	RPD	Lab Control Limit
SD-PER212-0314SD	Aroclor 1260	48.8	30

The RPD is within the QAPP limits, and no qualifiers are required.

Field duplicate RPDs: Field duplicate RPDs were below 50% where the concentrations were above five times the reporting limit with the following exception:

FD ID / SampleID	Analyte	FD Result (ug/kg)	Sample Result (ug/kg)	RPD
SD-PER426-0314 / SD-PER406-0314	Aroclor 1260	28	84	100

This analyte is qualified as estimated in the field duplicate and parent sample.

Laboratory flags: Various results are flagged Y to indicate elevated reporting limits. These results are qualified "UY" to clarify that the aroclor was not detected.

Reporting limits: RLs for various aroclors were elevated above 20 ug/Kg due to chromatographic overlap with other aroclors and necessary dilution. These samples also contained detected aroclors and the impact on the total PCB value was minimal. No qualifiers are assigned on the basis of elevated reporting limits.

Overall assessment: Documentation was found to be clear and complete. Calibration data demonstrate acceptable instrument performance. Laboratory QC sample results demonstrate acceptable accuracy and precision. Results were estimated due to matrix spike recoveries and field duplicate variability.

PCB data are acceptable for use as qualified.

3.0 Metals Analyses

Quality control analysis frequencies: The QAPP specifies that the following quality control samples be analyzed one per analytical batch or one per twenty samples, whichever is more frequent: method blank, and laboratory control sample (LCS). A matrix spike (MS) and laboratory duplicate must be analyzed one per twenty samples. These frequencies were met.

Field quality control sample requirements include field duplicates at a 10% frequency. Four field duplicates were analyzed, meeting this requirement.

Holding times: Total or dissolved mercury samples must be analyzed within 28 days of collection. Other metals samples must be analyzed with 180 days. These criteria were met.

Instrument calibration: Functional guidelines criteria for calibration verifications is a maximum % difference of ±10% for ICP metals and ±15% for mercury. Criteria for calibration blanks are that analyte concentrations must be between the negative RL and the positive RL. Functional guidelines criterion for detection limit standard recovery is 70-130%, and the QAPP specifies this standard must be within one RL of the true value. These criteria were met calibration verifications and blanks with the following exceptions:

Standard ID	Analyte	Recovery (%)	Control Limit (%)
YD22 RL2	Copper	141.5	70-130
YD87/YE10 RL2	Copper	134.0	70-130

Associated positive copper results are qualified as estimated. Non-detect results are considered unaffected.

Laboratory blank results: Criteria for method blanks are that analyte concentrations must be below the PQL, or below 10% of the lowest associated sample concentration. These criteria were met.

LCS recoveries: QAPP control limits were 80-120%. LCS recoveries were within QAPP and laboratory control limits.

SRM recoveries: SRM concentrations were within the advisory range.

MS recoveries: QAPP control limits were 75-125%. Functional guidelines criteria for both ICP metals and mercury are 75-125%. MS recoveries were within QAPP and laboratory control limits.

Laboratory duplicate RPDs: QAPP control limits were <20%. For duplicates with concentrations above five times the reporting limit, RPDs were within QAPP and laboratory control limits with the following exceptions:

QC ID	Analyte	RPD	Lab Control Limit
SD-PER212-0314LR	Arsenic	25.0	20
SD-PER212-0314LR	Copper	29.7	20

These results are qualified as estimated in the parent sample.

For sample/duplicate pairs with concentrations below five times the reporting limit, absolute differences were less than one reporting limit.

Field duplicate RPDs: Field duplicate RPDs were below 20% where the concentrations were above five times the reporting limit with the following exceptions:

FD ID / SampleID	Analyte	FD Result (mg/kg)	Sample Result (mg/kg)	RPD
SD-PER327-0314 / SD-PER307-0314	Arsenic	8.1	6.5	21.9
SD-PER426-0314 / SD-PER406-0314	Arsenic	7.9	10.2	25.4
SD-PER230-0314 / SD-PER210-0314	Chromium	28.1	36	24.6
SD-PER327-0314 / SD-PER307-0314	Copper	35.2	116	107
SD-PER230-0314 / SD-PER210-0314	Mercury	0.11	0.21	62.5

These analytes are qualified as estimated in the field duplicate and parent sample.

Field duplicate concentrations were within +/- two times the reporting limit where concentrations were below five times the reporting limit.

Reporting limits: Some RLs were elevated above QAPP levels due to dry weight calculation or sample dilution:

Analyte	QAPP specified RL (mg/kg)	Highest Reported RL (mg/kg	SMS SQS (mg/kg)
Mercury	0.025	0.030	0.41
Silver	0.30	0.70	6.1
Cadmium	0.40	0.20	5.1

Each elevated RL was below the screening level and the impact on data use is minimal. No qualifiers are assigned on the basis of elevated reporting limits.

Overall assessment: Documentation was found to be clear and complete. Calibration data demonstrate acceptable instrument performance. Method blank, LCS, SRM, and MS results demonstrate acceptable accuracy. Data were estimated due to field and laboratory duplicate variability, and high detection limit standard recoveries.

Metals data are acceptable for use as qualified.

4.0 General Chemistry Analyses

Quality control analysis frequencies: For total organic carbon, a method blank, SRM, and LCS were analyzed in each batch. Three of the four batches also included a MS and laboratory triplicate. For total solids, each batch included a method blank and a laboratory triplicate. Four field duplicates were also analyzed. Quality control samples were sufficient to evaluate precision and accuracy as appropriate for the method.

Holding times: Holding times are as follows:

Analysis	Holding time if refrigerated	Holding time if frozen
TOC	28 days	6 months
Total Solids	14 days	6 months

Samples were analyzed within the holding times.

Instrument calibration: Instrument calibration criteria are as follows:

Analysis	Criteria
TOC	Initial calibration $R^2 > 0.990$ Continuing calibration recovery within 90-110%
Total Solids	Calibration mass within $\pm$ 0.1 g

These criteria were met.

Laboratory blank results: Criteria for method blanks are that analyte concentrations must be below the PQL, or below 10% of the lowest associated sample concentration. This criterion was met for all method blanks.

LCS recoveries: Control limits were 75-125% for TOC. These criteria were met.

SRM results: Control limits were 80-120% for TOC. These criteria were met.

MS recoveries: Control limits were 75-125% for TOC. These criteria were met.

Laboratory duplicate and triplicate results: Control limits were 20% for TOC and total solids. These criteria were met with the following exceptions:

QC ID	Analyte	RSD	Lab Control Limit
SD-PER301-0314LT	Total Organic Carbon	28.2	20.0
SD-PER312-0314LT	Total Organic Carbon	21.7	20.0

The TOC results are qualified as estimated in the parent sample.

Field duplicate results: TOC field duplicate RPDs exceeded 20% as follows:

FD ID	Analyte	FD Result (%)	Sample Result (%)	RPD
SD-PER126-0314 / SD-PER106-0314	TOC	2.40	1.76	30.8
SD-PER327-0314 / SD-PER307-0314	TOC	2.41	1.55	43.4
SD-PER426-0314 / SD-PER406-0314	TOC	1 .00	1.30	26.1

The TOC results are qualified as estimated in the samples and field duplicates.

The total solids field duplicate RPDs were below 20%.

Overall assessment: Documentation was found to be clear and complete. Calibration data indicate acceptable performance. Laboratory QC results demonstrate acceptable laboratory accuracy. Data were estimated based on laboratory and field duplicate variability.

General chemistry results are acceptable for use as qualified.

5.0 Qualifier Summary Table

Client ID	Analyte(s)	Qualifier	Reason
Polychlorinated Biphenyl Analyses			
SD-PER205-0314	Aroclor 1248, Aroclor 1254, Aroclor 1260	R1	Another result available
SD-PER205-0314 DL	All except Aroclor 1248, Aroclor 1254, Aroclor 1260	R1	Another result available
SD-PER212-0314	Aroclor 1260	J	Low MS recovery
SD-PER305-0314	Aroclor 1248	UY	Clarification of Y flag
SD-PER307-0314	Aroclor 1248	UY	Clarification of Y flag
SD-PER311-0314	Aroclor 1248	UY	Clarification of Y flag
SD-PER327-0314	Aroclor 1248	UY	Clarification of Y flag
SD-PER406-0314	Aroclor 1260	J	High FD RPD
Metals Analyses			
SD-PER210-0314	Chromium, Mercury	J	High FD RPD
SD-PER212-0314	Arsenic, Copper	J	High lab duplicate RPD
SD-PER301-0314	Mercury	J	High lab duplicate RPD
SD-PER304-0314	Mercury	J	High lab duplicate RPD

Client ID	Analyte(s)	Qualifier	Reason
SD-PER307-0314	Arsenic, Copper	J	High FD RPD
SD-PER406-0314	Arsenic	J	High FD RPD
General Chemistry Analyses			
SD-PER106-0314	Total Organic Carbon	J	High FD RPD
SD-PER301-0314	Total Organic Carbon	J	High lab duplicate RPD
SD-PER307-0314	Total Organic Carbon	J	High FD RPD
SD-PER312-0314	Total Organic Carbon	J	High lab triplicate RPD
SD-PER406-0314	Total Organic Carbon	J	High FD RPD

6.0 Abbreviations and Definitions

DV Qualifier	Definition
U	The material was analyzed for, but was not detected above the level of the associated value.
UY	The reporting limit was elevated due to chromatographic overlap with related compounds. The material was analyzed for, but was not detected above the level of the associated value.
J	The analyte was positively identified. The associated numerical value is the approximate concentration of the analyte in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
UJ	The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	The sample result is rejected. The presence or absence of the analyte cannot be verified and data are not usable.
R1	This sample result has been rejected in favor of a more accurate and/or precise result. The other result should be used.

Abbreviation	Definition
DV	Data validation
LCS	Laboratory control sample
MS	Matrix spike
MSD	Matrix spike duplicate
NA	Not Applicable
RL	Reporting limit
RPD	Relative percent difference
RRM	Regional reference material
RSD	Relative standard deviations
SRM	Standard reference material

7.0 References

USEPA Contract Laboratory Program National Functional Guidelines For Superfund Organic Methods Data Review, Office of Superfund Remediation and Technology Innovation, U.S. Environmental Protection Agency, June 2008, USEPA-540-R-008-01.

USEPA Contract Laboratory Program National Functional Guidelines For Inorganic Superfund Data Review, Office of Superfund Remediation and Technology Innovation, U.S. Environmental Protection Agency, January 2010, USEPA-540-R-10-011.

Construction and Post-Construction Sediment Monitoring Quality Assurance Project Plan, Duwamish Sediment Other Area and Southwest Bank Corrective Measure and Habitat Project, Boeing Plant 2. Prepared by AMEC Environment & Infrastructure Inc., et al. Prepared for: The Boeing Company, December 2012

South Shoreline Subsurface Environmental Characterization Quality Assurance Project Plan, Duwamish Sediment Other Area and Southwest Bank Corrective Measure and Habitat Project, Boeing Plant 2. Prepared by AMEC Environment & Infrastructure Inc., et al. Prepared for: The Boeing Company, June 2013

POST-CONSTRUCTION CORE SAMPLE DATA VALIDATION REPORT

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DATA VALIDATION REPORT

Boeing Plant 2–Post Construction Core Data – January and February 2014

Prepared for:
AMEC Environment & Infrastructure, Inc.
3500 188th Street SW, Ste 601
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April 08, 2014

1.0 Introduction

Data validation was performed on the following laboratory data:

Sample ID	Sample Date/Time	Lab ID	Analyses
SD-PCC014-A	01/21/14 03:50 PM	14-1189-XV53A	PCBs, Metals, TOC, TS
SD-PCC014-B	01/21/14 03:52 PM	14-1190-XV53B	PCBs, Metals, TOC, TS
SD-PCC013-A	02/04/14 11:32 AM	14-1938-XY13A	PCBs, Metals, TOC, TS
SD-PCC013-B	02/04/14 11:32 AM	14-1939-XY13B	PCBs, Metals, TOC, TS
SD-PCC213-A	02/04/14 11:51 AM	14-1940-XY13C	PCBs, Metals, TOC, TS
SD-PCC012-A	02/13/14 11:53 AM	14-2476-XZ25A	PCBs, Metals, TOC, TS
SD-PCC012-B	02/13/14 11:53 AM	14-2477-XZ25B	PCBs, Metals, TOC, TS

Analyses were performed by Analytical Resources, Inc. in Tukwila, Washington.

Validation: A summary validation was performed for these analyses. Validation was performed by Cari Sayler. Data qualifiers are summarized in section 5.0 of this report.

Analytical methods: Table 1 and table 2 of the QAPP specify the following analytical methods:

Analysis	Method
Polychorinated Biphenyls	EPA 8082 with 3665B/3660B cleanups
Metals(except mercury)	EPA 6010
Mercury	EPA 7471A
Total Organic Carbon	EPA 9060
Total Solids	160.1

These methods were used with the following exceptions: The most recent version of the methods for PCB (8082A) was used. Arsenic was analyzed by method 200.8. Soil Total Organic Carbon (TOC) analyses were performed by Plumb, 1981, and Total solids analyses were performed by EPA method 2540G. These are considered acceptable substitutions. Additionally, PCB cleanups included silica gel in addition to the specified sulfur and acid cleanups.

Sample Receipt: Sample chain-of-custodies were reviewed. Requested analyses were performed.

Sample number transcription: Sample IDs in the electronic data deliverable (EDD) were compared to the chain-of-custody for each sample. Sample IDs matched the chain of custody.

2.0 PCB Analyses

Quality control analysis frequencies: The QAPP specifies that the following quality control samples be analyzed one per analytical batch or one per twenty samples, whichever is more frequent: method blank, and laboratory control sample (LCS). A matrix spike (MS) and MS duplicate (MSD) must be analyzed one per twenty samples and a regional reference material (RRM) must be analyzed one per fifty samples. In addition, surrogate compounds must be measured in each field and quality control sample. These frequencies were met.

Field quality control sample requirements include field duplicates at a 10% frequency. One field duplicate was analyzed, meeting this requirement.

Holding times: Refrigerated sediment samples must be extracted within 14 days of collection. Frozen sediment samples must be extracted within 1 year of collection. Extracts must be analyzed within 40 days of extraction. These holding times were met.

Instrument calibration: Data usability criteria for calibrations include minimum correlation coefficients (R^2) of 0.990 or maximum RSDs of $\pm$20% for each initial calibration, and maximum % differences of $\pm$25% for each continuing calibration. These criteria were met.

Laboratory blank results: Criteria for blanks are that analyte concentrations must be below the RL, or below 10% of the lowest associated sample concentration. These criteria were met.

Surrogate recoveries: QAPP control limits were 34-141%. Surrogate recoveries were within QAPP and laboratory control limits.

LCS recoveries: QAPP control limits were 37-116%. LCS recoveries were within QAPP and laboratory control limits.

RRM recoveries: RRM Aroclor 1260 results was 96 ug/kg. This result is within the advisory limits of 38-167%.

MS recoveries: QAPP control limits were 37-116%. MS other recoveries were within QAPP and laboratory control limits.

MS/MSD RPDs: QAPP control limits were 50%. RPDs were within QAPP and laboratory control limits.

Field duplicate RPDs: Field duplicate RPDs were below 50% where the concentrations were above five times the reporting limit with the following exception:

FD ID / Sample ID	Analyte	FD Result (ug/kg)	Sample Result (ug/kg)	RPD
SD-PCC213-A / SD-PCC013-A	Aroclor 1260	60	22	92.7

This analyte are qualified as estimated in the field duplicates and parent sample.

Laboratory flags: Various results are flagged Y to indicate elevated reporting limits. These results are qualified "UY" to clarify that the aroclor was not detected.

Reporting limits: RLs for various aroclors were elevated above 20 ug/Kg due to chromatographic overlap with other aroclors and necessary dilution. These samples also contained detected aroclors and the impact on the total PCB value was minimal. No qualifiers are assigned on the basis of elevated reporting limits.

Overall assessment: Documentation was found to be clear and complete. Calibration data demonstrate acceptable instrument performance. Laboratory QC sample results demonstrate acceptable accuracy and precision. Results were estimated due to field duplicate variability.

PCB data are acceptable for use as qualified.

3.0 Metals Analyses

Quality control analysis frequencies: The QAPP specifies that the following quality control samples be analyzed one per analytical batch or one per twenty samples, whichever is more frequent: method blank, and laboratory control sample (LCS). A matrix spike (MS) and laboratory duplicate must be analyzed one per twenty samples. These frequencies were met.

Field quality control sample requirements include field duplicates at a 10% frequency. One field duplicate pair was analyzed, meeting this requirement.

Holding times: Total or dissolved mercury samples must be analyzed within 28 days of collection. Other metals samples must be analyzed with 180 days. These criteria were met.

Instrument calibration: Functional guidelines criteria for calibration verifications is a maximum % difference of ±10% for ICP metals and ±15% for mercury. Criteria for calibration blanks are that analyte concentrations must be between the negative RL and the positive RL. Functional guidelines criterion for detection limit standard recovery is 70-130%, and the QAPP specifies this standard must be within one RL of the true value. These criteria were met calibration verifications and blanks with the following exceptions:

Standard ID	Analyte	Recovery (%)	Control Limit (%)
XV53 CCV1	Mercury	115.8	85-115
XV53 CCV2	Mercury	116.0	85-115

Associated positive mercury results are qualified as estimated. Non-detect results are considered unaffected.

Laboratory blank results: Criteria for method blanks are that analyte concentrations must be below the PQL, or below 10% of the lowest associated sample concentration. The following contamination was detected in the method blanks.

Blank ID	Analyte	Concentration (mg/kg)	RL (mg/kg)
14-2477-XZ25MB	Zinc	1	1

Zinc results in the associated samples are above ten times this level and no qualifiers are required.

LCS recoveries: QAPP control limits were 80-120%. LCS recoveries were within QAPP and laboratory control limits.

SRM recoveries: SRM concentrations were within the advisory range.

MS recoveries: QAPP control limits were 75-125%. Functional guidelines criteria for both ICP metals and mercury are 75-125%. MS recoveries were within QAPP and laboratory control limits.

Laboratory duplicate RPDs: QAPP control limits were <20%. For duplicates with concentrations above five times the reporting limit, RPDs were within QAPP and laboratory control limits with the following exceptions:

QC ID	Analyte	RPD	Lab Control Limit
SD-PCC014-ALR	Chromium	28.1	20
SD-PCC014-ALR	Mercury	28.6	20
SD-PCC013-ALR	Arsenic	35.9	20
SD-PCC012-ALR	Lead	186	20
SD-PCC012-ALR	Zinc	24.7	20

These results are qualified as estimated in the parent sample.

For sample/duplicate pairs with concentrations below five times the reporting limit, absolute differences were within the reporting limit with one exception:

QC ID	Analyte	Duplicate Result (mg/kg)	Sample Result (mg/kg)	RL (mg/kg)
SD-PCC012-ALR	Lead	168	6	3

This result is qualified as estimated in the parent sample.

Field duplicate RPDs: Field duplicate RPDs were below 20% where the concentrations were above five times the reporting limit with the following exceptions:

FD ID	Analyte	FD Result (mg/kg)	Sample Result (mg/kg)	RPD
SD-PCC213-A / SD-PCC013-A	Chromium	13.8	11.2	20.8
SD-PCC213-A / SD-PCC013-A	Zinc	32	26	20.7

These analytes are qualified as estimated in the field duplicate and parent sample.

Field duplicate concentrations were within +/- two times the reporting limit where concentrations were below five times the reporting limit.

Reporting limits: Some RLs were elevated above QAPP levels due to dry weight calculation or sample dilution:

Analyte	QAPP specified RL (mg/kg)	Highest Reported RL (mg/kg	SMS SQS (mg/kg)
Mercury	0.025	0.030	0.41
Silver	0.30	0.40	6.1

Each elevated RL was below the screening level and the impact on data use is minimal. No qualifiers are assigned on the basis of elevated reporting limits.

Overall assessment: Documentation was found to be clear and complete. Calibration data demonstrate acceptable ICP instrument performance. Method blank, LCS, SRM, and MS results demonstrate acceptable accuracy. Data were estimated due to field and laboratory duplicate variability, and high calibration recoveries.

Metals data are acceptable for use as qualified.

4.0 General Chemistry Analyses

Quality control analysis frequencies: For total organic carbon, a method blank, SRM, and LCS were analyzed in each batch. Two of the three batches also included a MS and laboratory triplicate. For total solids, each batch included a method blank. Two of the three batches also included a laboratory triplicate. One field duplicate was also analyzed. Quality control samples were sufficient to evaluate precision and accuracy as appropriate for the method.

Holding times: Holding times are as follows:

Analysis	Holding time if refrigerated	Holding time if frozen
TOC	28 days	6 months
Total Solids	14 days	6 months

Samples were analyzed within the holding times.

Instrument calibration: Instrument calibration criteria are as follows:

Analysis	Criteria
TOC	Initial calibration $R^2 > 0.990$ Continuing calibration recovery within 90-110%
Total Solids	Calibration mass within $\pm$ 0.1 g

These criteria were met.

Laboratory blank results: Criteria for method blanks are that analyte concentrations must be below the PQL, or below 10% of the lowest associated sample concentration. This criterion was met for all method blanks.

LCS recoveries: Control limits were 75-125% for TOC. These criteria were met.

SRM results: Control limits ranged from 75-125 to 80-120% for TOC. These criteria were met.

MS recoveries: Control limits were 75-125% for TOC. These criteria were met.

Laboratory duplicate and triplicate results: Control limits were 20% for TOC and total solids. These criteria were met.

Field duplicate results: TOC field duplicate RPDs exceeded 20% as follows:

FD ID / Sample ID	Analyte	FD Result (%)	Sample Result (%)	RPD
SD-PCC213-A / SD-PCC013-A	Total Organic Carbon	0.157	0.454	97.2

The TOC result is qualified as estimated in the sample and field duplicate.

The TS field duplicate RPDs were below 20%.

Overall assessment: Documentation was found to be clear and complete. Calibration data indicate acceptable performance. Laboratory QC results demonstrate acceptable laboratory accuracy and precision. One data point was estimated based on field duplicate variability.

General chemistry results are acceptable for use as qualified.

5.0 Qualifier Summary Table

Client ID	Analyte(s)	Qualifier	Reason
Polychlorinated Biphenyl Analyses			
SD-PCC012-A	Aroclor 1248	UY	Clarification of Y flag
SD-PCC012-B	Aroclor 1248, Aroclor 1254	UY	Clarification of Y flag
SD-PCC013-A	Aroclor 1248, Aroclor 1254	UY	Clarification of Y flag
SD-PCC013-A	Aroclor 1260	J	High FD RPD
SD-PCC013-B	Aroclor 1232	UY	Clarification of Y flag
SD-PCC014-A	Aroclor 1248, Aroclor 1254	UY	Clarification of Y flag
SD-PCC014-B	Aroclor 1248, Aroclor 1254	UY	Clarification of Y flag
SD-PCC213-A	Aroclor 1248, Aroclor 1254	UY	Clarification of Y flag
Metals Analyses			
SD-PCC012-A	Lead	J	High lab duplicate difference
SD-PCC012-A	Zinc	J	High lab duplicate RPD
SD-PCC013-A	Arsenic	J	High lab duplicate RPD
SD-PCC013-A	Chromium, Zinc	J	High FD RPD
SD-PCC014-A	Mercury	J	High lab duplicate RPD, High CCV recoveries
SD-PCC014-A	Chromium	J	High lab duplicate RPD
General Chemistry Analyses			
SD-PCC013-A	Total Organic Carbon	J	High FD RPD

6.0 Abbreviations and Definitions

DV Qualifier	Definition
U	The material was analyzed for, but was not detected above the level of the associated value.
UY	The reporting limit was elevated due to chromatographic overlap with related compounds. The material was analyzed for, but was not detected above the level of the associated value.
J	The analyte was positively identified. The associated numerical value is the approximate concentration of the analyte in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
UJ	The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	The sample result is rejected. The presence or absence of the analyte cannot be verified and data are not usable.
R1	This sample result has been rejected in favor of a more accurate and/or precise result. The other result should be used.

Abbreviation	Definition
DV	Data validation
LCS	Laboratory control sample
MS	Matrix spike
MSD	Matrix spike duplicate
NA	Not Applicable
RL	Reporting limit
RPD	Relative percent difference
RRM	Regional reference material
RSD	Relative standard deviations
SRM	Standard reference material

7.0 References

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